

Claims

sub a⁷ 1. An isolated polypeptide comprising a functional long chain polyunsaturated fatty acid (PUFA) elongase as herein defined.

2. A polypeptide according to claim 1 wherein the polypeptide is from a eukaryote.

sub a⁸ 3. A polypeptide according to claim 1 or claim 2 wherein the polypeptide has at least a portion of the amino acid sequence shown in SEQ ID 15, or variants thereof.

4. A polypeptide having at least 60% homology to a polypeptide according to claim 3 and having a PUFA elongase function.

5. A polypeptide according to claim 4 having at least 80% homology.

6. A polypeptide according to claim 5 having at least 90% homology.

sub a⁹ 7. A polypeptide according to any preceding claim wherein the polypeptide sequence includes a sequence motif responsible for Endoplasmic Reticulum (ER) - retention.

8. A polypeptide according to any preceding claim wherein the polypeptide is capable of elongating palmitoleic acid (PA; 16:1 Δ^9) to vaccenic acid (VA; 18:1 Δ^{11}).

9. A polypeptide according to any preceding claim wherein the polypeptide is from an animal.

10. A polypeptide according to claim 9 wherein the animal is an invertebrate.

11. A polypeptide according to claim 10 wherein the invertebrate is a worm.

12. A polypeptide according to claim 11 wherein the worm is *C. elegans*.

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13. A polypeptide according to claim 9 wherein the animal is a vertebrate.

14. A polypeptide according to claim 13 wherein the vertebrate is a mammal.

15. A polypeptide according to claim 14 wherein the mammal is a human, rat or mouse.

sub A¹⁰ 16. A DNA sequence encoding a polypeptide according to any preceding claim.

17. A DNA sequence according to claim 16 wherein the DNA comprises the sequence shown in SEQ ID 7 or variants of that sequence due to base substitutions, deletions and/or additions.

18. An engineered organism engineered to express a polypeptide according to any one of claims 1 to 15.

19. An engineered organism according to claim 18 wherein the animal is a mammal.

20. An engineered organism according to claim 19 wherein the mammal is a rat, mouse or monkey.

sub A¹¹ 21. An engineered organism containing a synthetic pathway for the production of a polypeptide according to any one of claims 1 to 15.

22. An engineered organism according to claim 21 wherein the pathway includes Δ^3 -fatty acid desaturase.

sub A¹² 23. An engineered organism according to claim 21 or 22 wherein the pathway includes Δ^6 -fatty acid desaturase.

24. An engineered organism according to any one of claims 21 to 23 wherein the animal is a lower eukaryote.

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25. An engineered organism according to claim 24 wherein the lower eukaryote is a yeast.
26. An engineered organism according to claim 18 wherein the animal is a fish.

sub a¹³

27. A transgenic plant engineered to express a polypeptide according to any one of claims 1 to 15.

28. A transgenic plant containing a DNA sequence according to claim 16 or 17.

29. A method of producing a PUFA comprising carrying out an elongase reaction catalysed by a polypeptide according to any one of claims 1 to 15.

30. A method according to claim 29 wherein the PUFA is di-homo-gamma-linoleic acid ($20:3\Delta^{8,11,14}$), arachidonic acid ($20:4\Delta^{5,8,11,14}$), eicosapentanoic acid ($20:5\Delta^{5,8,11,14,17}$), docosatrienoic acid ($22:3\Delta^{3,16,19}$), docosatetraenoic acid ($22:4\Delta^{7,10,13,16}$), docosapentaenoic acid ($22:5\Delta^{7,10,13,16,19}$) or docosahexaenoic acid ($22:6\Delta^{4,7,10,13,16,19}$).

31. A method according to claim 29 wherein the PUFA is a 24 carbon fatty acid with at least 4 double bonds.

sub a¹⁴

32. A PUFA produced by a method according to any one of claims 29 to 31.

33. A foodstuff comprising a PUFA according to claim 32.

34. A dietary supplement comprising a PUFA according to claim 32.

sub a¹⁵

35. A pharmaceutical composition comprising a polypeptide according to any one of claims 1 to 15.

36. A pharmaceutical composition comprising a PUFA according to claim 32.

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37. A pharmaceutical composition according to claim 35 or claim 36 wherein the composition comprises a pharmaceutically-acceptable diluent, carrier, excipient or extender.

38. A method of elevating the PUFA levels of an animal or a plant by supplying to the animal or plant a polypeptide according to any of claims 1 to 15, a DNA sequence according to claim 16 or claim 17, a foodstuff according to claim 33, a dietary supplement according to claim 34, a pharmaceutical composition according to any of claims 35 to 37 or a PUFA according to claim 32.

39. A method of treatment according to claim 38 wherein the animal is a mammal.

40. A method of treatment according to claim 39 wherein the mammal is a human.

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